Using Clinical Data as a Surveillance Tool in the Workplace

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If I have manually recorded clinical chart records, how can the computer assist me in using this information to conduct surveillance of employee injuries and illnesses at my worksite?

Occupational health nurses routinely collect clinical information and enter it in the worker's clinical chart record. While a single chart provides information for making clinical decisions for an individual, the information from many charts is needed for summarizing trends in worker illness and injury across a worker population. With summary information on a group of workers, the occupational health nurse can plan for illness and injury prevention programs.

While computerized occupational health record systems are becoming more commonplace at the worksite, many occupational health nurses rely on manual recording. However, if the occupational health nurse has access to a computer for conducting analysis, information from the manual records can be entered into the computer to generate useful summary information on the nature and extent of worker injuries and illnesses.

This article illustrates how the computer may be used as an aid in conducting surveillance of worker injuries and illnesses. Examples for each step in the process are taken from a chart review of firefighters' records from one occupational health clinic. The chart review provided information about the extent and nature of musculoskeletal injuries in the worker group and was used as a basis for program planning.

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STEPS IN THE PROCESS

Determining What Charts to Review

At this initial stage, the occupational health nurse needs to decide the purpose for doing the chart review. For example, the occupational health nurse's purpose may be to determine the nature and extent of injuries in a particular plant. Alternatively, one may be interested in a certain type of injury, such as eye injuries or lacerations. In this case, the authors were interested in all reported musculoskeletal injuries for firefighters. The occupational health clinic nurse selected all charts of firefighter musculoskeletal injuries using worker codes and ICD 9 codes. A total of 90 firefighters had incurred 109 musculoskeletal injury episodes in the preceding 3 years.

Designing the Data Collection Form

The data collection form is a questionnaire used for the purpose of retrieving or abstracting information from each worker record. Each piece

of information desired becomes a separate item on the data collection form (see Figure 1). The first step in designing a data collection form is to identify specific questions that would help identify the nature and extent of the problem. These questions/items come from the occupational health nurse's clinical judgment, the literature, and other published sources such as standardized data coding systems (e.g., ICD 9 and American National Standards Institute [ANSI] coding system). After determining what items are to be included on the data collection form, it is necessary to examine the employee records to determine if the data are available for each item.

Information in worker clinical records is generally not recorded for the purpose of surveillance. While some information from worker records is objective and relatively reliable (e.g., age, gender, weight, affected body part) other information is subjective. Subjective information is dependent on both the worker's perception and memory of an event and the recorder's ability to assess and evaluate the illness or injury and record the findings (Findley, 1991).

A preliminary inspection of the charts should be done to determine what types and quality of information is available in the records. This initial chart review requires that a small number of charts (about five to 10) be chosen at random for examination. If the exact information is not found in the chart inspection, substitute information may be available (Findley, 1991). In the example inspection, many charts did not have results from a physical fitness test offered to employees. However, height and weight measures were in all of the charts inspected. The authors decided to use the height and weight measures to calculate a body fat index which was used as an indicator of physical fitness status.

The Instruction Manual for the Data Collection Form

Information collected from the workers' charts needs to be assigned numbers for computer entry and for summarizing the information. An instruction manual for the data collection form is necessary for specifying how numbers are to be assigned to the data (see Figure 2). Some variables such as age, height, weight, and time of injury are already numeric and can be coded in the original form. Frequently, however, information is not provided in numbers, but instead is found in words or narrative entries. Information in word form will need to be coded by numbers on the data collection form. For example, "cause of injury" will be entered as "fell/slipped = 1," "lifting/carrying object = 2," "caught/trapped = 3," and so forth on the data collection form shown in Figure 1.

Each item needs to be abstracted in a consistent way from chart to chart. Establishing definitions for each item helps insure consistency in recording, especially if more than one recorder will be entering the information. In essence, the instruction manual contains directions for filling out the data collection form. In the example, the instruction manual for the data collection form shows that weight will be recorded in pounds with a conversion formula for converting kilograms to pounds.

Training Recorders

Recorders must be trained to ensure that information is retrieved in a consistent way from chart to chart (Castorr, 1990). This is a crucial step even when only one person plans to record the information. In the example, two nurse recorders abstracted information. A small number of charts (five to 10) are set aside for training purposes and are not included in the final chart record review (i.e., non-firefighter charts were used for training). The charts set aside for training are reviewed and information is abstracted according to the manual instructions. Notes should be made by each recorder describing which items were coded with ease and which ones were difficult to determine. Recorders also should discuss problems with data abstraction and ways to improve coding. From the review, categories were changed slightly to accommodate the available data. Training sessions are repeated until the recorders feel confident that valid information can be collected using the data collection form and instruction manual.

To assess whether information is reliable across different recorders and across different data collection times, the occupational health nurse can determine interrecorder (interrater) and intrarecorder (intrarater) reliability. Interrater reliability is the extent to which different raters code data consistently (Waltz, 1991). For example, if one recorder classifies a worker injury as one resulting from non-fire emergencies, an assessment is made to determine whether other recorders classify the same person the same way. To determine interrater reliability, several records are reviewed and coded by two or more recorders. The coding results will be assessed for level of agreement.

Intrarater reliability is the consistency with which one rater classifies a group of persons or variables on

VARIABLE NAME	DESCRIPTION	CODE NUMBER
{REV}	Reviewer's initials	_____
{DATE}	Today's date	_____
{ID}	Chart review code number	_____
{FDEPT}	Municipality code number	_____
{UNION}	Union status of fire fighters	Union . . . . . 1 Nonunion . . . . . 2 Unknown 3
{BIRTH}	Date of birth	_____–_____–_____ month day year
{GENDER}	Fire fighter's gender	Male . . . . . 1 Female . . . . . 2 Unknown 3
{RACE}	Race of fire fighter	Afro–American . . . . . 1 Asian . . . . . 2 Caucasian . . . . . 3 Latin–American . . . . . 4 Other . . . . . 5 Unknown 6
{HEIGHT}	Height (*IN INCHES*)	_____ Unknown 99
{WEIGHT}	Weight (*IN POUNDS*)	_____ Unknown 999
{BODYPART}	Body part affected	(*CIRCLE ALL THAT APPLY*) Arm . . . . . 1 Cervical spine . . . . . 2 Chest wall/ribs . . . . . 3 . . . Skull . . . . . 11 Thoracic spine 12
{ICD9}	ICD9 Code (*SEE MANUAL FOR ICD9 CODE NUMBERS*)	_____
{CAUSE}	Cause of injury	Fall/slipped . . . . . 1 Lifting/carrying object . . . . . 2 Caught/trapped . . . . . 3 Struck by object . . . . . 4 Jumped . . . . . 5 Other (*WRITE IN DETAIL*) _____ _____

Figure 1: Example from the data collection form.

Eligibility

Certain criteria have to be met for a client to be included in this study; these are:

1. Under the care of Occupational Health Clinic ABC between the years 1988 and 1991.
2. Employed as a firefighter in the municipalities of ABC. . . Z.
3. Received medical care as a direct result of a musculoskeletal injury received while at work for the fire department.
4. Seen by a physician from Occupational Health Clinic ABC.

Item	Variable Name	Directions for Using the Data Collection Form
1	REV	Write in initials of chart reviewer's first and last name.
2	DATE	Document **today's date.**
3	ID	Charts are to be numbered from 1 to 88. Document the coded number for chart identification.
4	FDEPT	Write in the fire department code number according to the following:
		Municipality — **Code Number** A — 1 B — 2 . — . . — . . — . Z — 11
5	UNION	Circle appropriate data.
6	BIRTH	Date of birth as presented in chart.
7	GENDER	Circle appropriate data.
8	RACE	Circle appropriate data.
9	HEIGHT	Height in total inches (inches = centimeters + 2.5).
10	WEIGHT	Weight in pounds (pounds = kilograms ÷ 0.45). Record weight at first visit, current injury. If not available, record previous weight.
11	BODY PART	Circle appropriate data. More than one number may be circled.
12	ICD 9	See "Clinical Criteria for Disease Staging" (Appendix B).
13	CAUSE	Descriptions for "cause of injury" are as follows: Fell/slipped in hole, outside structure in hole burned in floor . . . Jumped from fire truck/equipment from roof

Figure 2: Example from the instruction manual.

two separate occasions (Waltz, 1991). As the data from a worker's clinical record are not likely to change with time (unless the client uses the clinic after the first recording and before the second recording), the time between recordings is not specified but usually is no more than 2 weeks apart. Both interrater and intrarater reliability are too involved for discussion in this paper; the authors recommend Waltz (1991) for further information.

Obtaining adequate interrater and intrarater reliability is sometimes difficult. However, careful attention to training raters about the use of the data collection form and the instruction manual helps insure adequate consistency.

Computerized Data Entry

Data entry includes a process of getting the numbers into the computer and conducting initial analysis to locate data errors. The code numbers that are entered on the data collection form (representing variable categories) (see Figure 1) must be put into a form the computer can "read." Setting up a data collection form with code numbers and variable names facilitates entering data into the computer. The coded information from the data collection form is entered directly into the computer. Many different software programs are available for data entry and processing. One inexpensive program in the public domain is Epi Info (Centers for Disease Control and Prevention, 1994) which automatically places data directly into columns in a format (i.e., ASCII) to be used by any statistical analysis program.

Computerized Data Analysis

A variety of methods to inspect

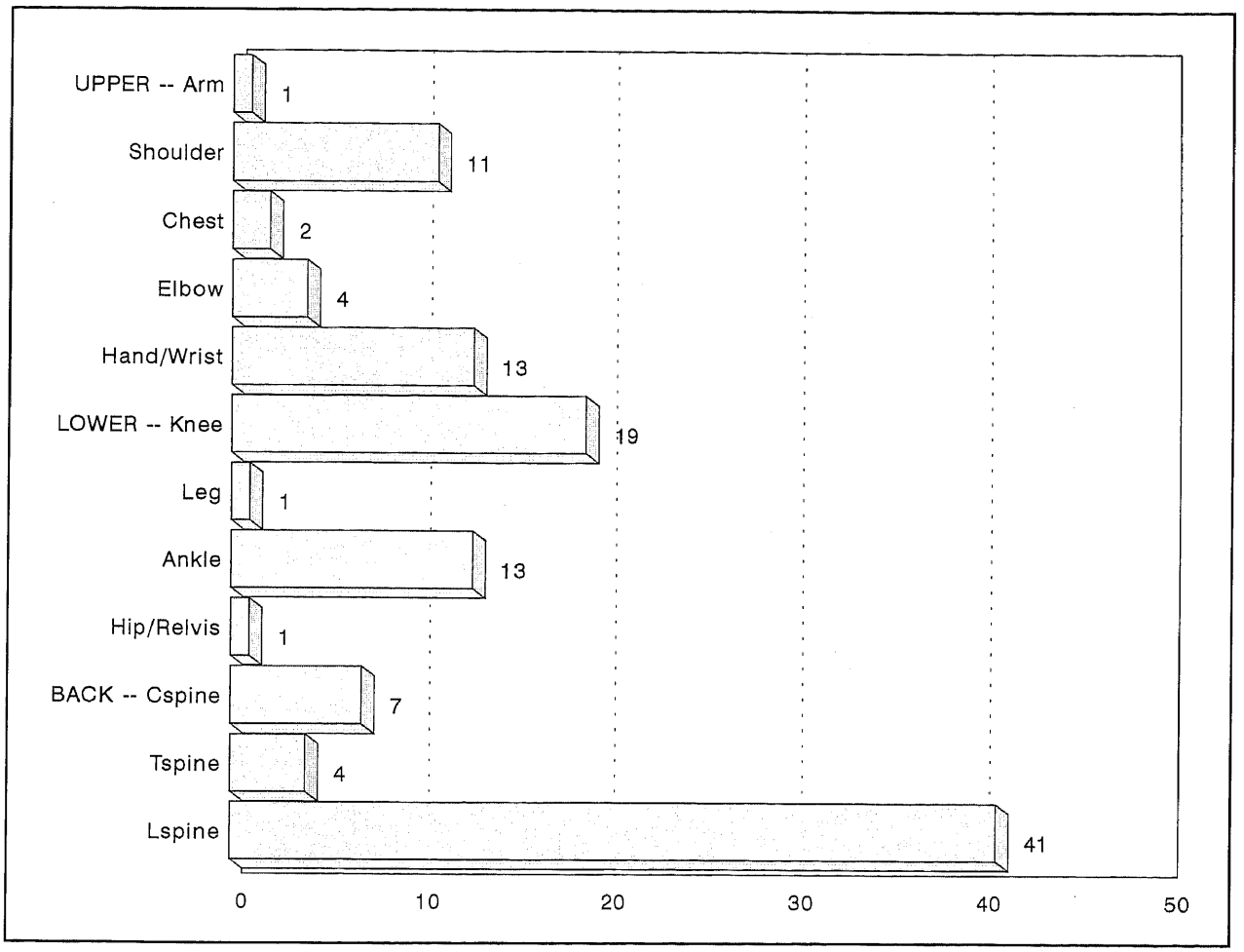

Figure 3: Distribution of injuries by body part.

and "clean" the data set may be used to assure recording accuracy (Barhyte, 1985). One method is to examine the frequency distributions of the variables to be sure that only legitimate values appear. For example, the variable "race," shown in Figure 1, can be coded 1 to 5 or 9 for missing data. If the frequency distribution listed a 6 for a category, there is an error in data entry. The nurse also can compare the number of data entry errors with a predetermined number of acceptable errors (Barhyte, 1985). Errors in data entry also can be found by entering the data twice for each record. If error free, the two sets of data should be identical. Values for each variable are compared and examined for discrepancies (Barhyte, 1985). The authors refer the reader to the Epi Info (Centers for Disease Control and Prevention, 1994) as one example of a software program that can be used for recording data, identifying and correcting recording errors, and analyzing the data.

Reporting the Results

For the most part, the occupational health nurse may be interested in simply identifying such summary information as the mean (average), frequency (count), percentage, and range (the minimum number and maximum number) for events or

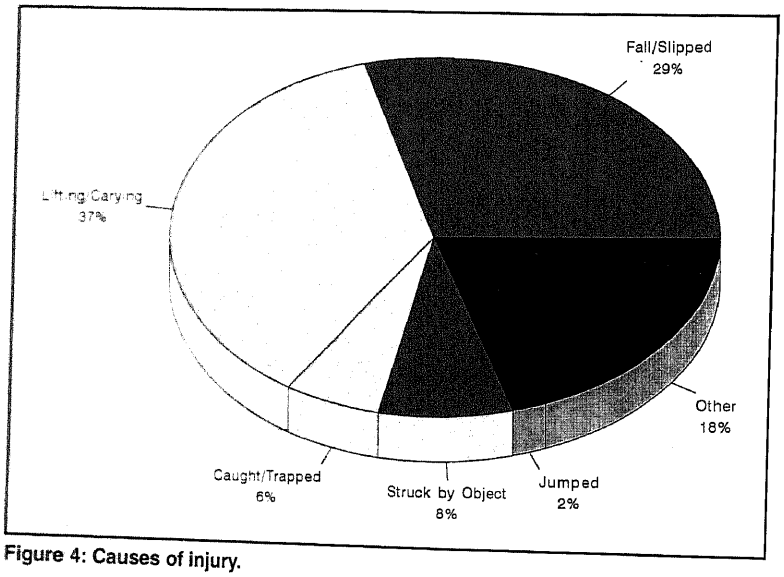

Figure 4: Causes of injury.

cases reported. For instance, in the example chart review analysis, the authors wanted to know about such things as the background characteristics of the injured firefighters (gender, municipality, union status), the body part injured, the reported cause of injury, and the ICD 9 code for each injury.

The computer output showed that the firefighters who were treated for musculoskeletal injuries at the occupational health clinic came from six municipalities, all were male, and 77% belonged to the union. The most common ICD 9 code was 846—lumbosacral spine strain/sprain—with 29.9% of the cases falling within this code. Consistent with the ICD 9 codes, the body part most frequently affected was the lumbar spine, with 41 cases reported. Also informative was information on the cause of injury. Lifting/carrying was the most frequently reported cause—37%. The data on the lumbar spine as the primary body part affected and lifting/carrying as the most frequently provided cause of injury are both consistent with national statistics on this worker group (Karter, 1993).

Computer graphics, if available, are a very effective way of visually presenting summary information to management. For example, a sample of a bar graph depicting body part affected (see Figure 3) and a pie chart showing the causes of injury (see Figure 4) dramatically illustrate very telling information. These kinds of summary assessment information suggest that a back injury prevention program that includes content on appropriate lifting and carrying would be appropriate for this worker group.

CONCLUSION

At first glance, using the computer as a surveillance tool may appear intimidating. In actuality, with a little patience and some guidance, the computer can make the difference between a program that is driven by "best guess hunches" on what the problem may be to a program that is informed by actual data. With surveillance as a critical task for many occupational health nurses today, acquiring computer skills can enhance the occupational health nurse's ability to prevent and reduce occupational health injuries and illnesses.

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